IEP Assessment Report for the Building at 45 Victoria Street, Petone, Lower Hutt

Executive Summary:

We have now completed an Initial Seismic Assessment (ISA) of the building at 45 Victoria Street, Petone, Lower Hutt, using the Initial Evaluation Procedure (IEP). The assessment was carried out after completing a site visit and reviewing available original design drawings.

The building at 45 Victoria Street, Petone, Lower Hutt, is mainly a single level workshop type of building with a very small mezzanine floor, which is supported and braced by timber walls. The subject building has light metal roof structure and the cladding of the building consists of full height reinforced concrete block walls, glazing and some partial height block walls (reinforced concrete block construction at the bottom half height (about 2.2 meters) and light timber frame construction at the upper half to the roof level). The lateral seismic resisting systems are reinforced concrete block walls of full height and cantilever columns in both transverse and longitudinal directions.

The building was originally designed in 1985. In 2015, a transverse wall was removed. It is noted that the building is not tied together well at roof level and the roof is not braced either.

For the IEP assessment reported here, subsoil class was assumed as soil "D" according to NZS1170.5: 2004. The integrity of the building is a concern and it could exacerbate the expected damage in earthquakes. As such, we assigned F=0.8 in both directions. Our assessment concluded that the seismic rating of the building complex is 55 % NBS (New Building Standard) for importance level two (IL2). Therefore the building is considered to be seismic grade C in accordance with the New Zealand Society for Earthquake Engineering (NZSEE) guidelines (Enclosed please also find the IEP assessment). Therefore the building is considered to be a medium risk.

The ISA is considered to provide a relatively quick, high-level and qualitative measure of the building's performance. A more reliable result will be obtained from a Detailed Seismic Assessment (DSA). A DSA could find CSWs (critical structural weakness) not identified from the IEP.

We have conducted an assessment, assuming that the suggested strengthening of the roof structure, as shown in attached sketch, is carried out. The revised seismic rating is 70% NBS (IL2). Therefore the building will be considered to be seismic grade B in accordance with the New Zealand Society for Earthquake Engineering (NZSEE) guidelines (Enclosed please also find the IEP assessment). Therefore the building will be classified to be a low or medium risk.

Limitations:

- The ISA assessment report is solely prepared for Richard Palmer/Allcar Ltd, who has engaged SYAL to provide an Initial Seismic Assessment of the building at this address.

- SYAL does not take any responsibilities for any consequences arising from using this report by any third party.

Background to the IEP and Its Limitations

The IEP procedure was developed in 2006 by the New Zealand Society for Earthquake Engineering (NZSEE) and updated in 2013 to reflect experience with its application and as a result of experience in the Canterbury earthquakes. It is a tool to assign a percentage score of New Building Standard (*%NBS*) and associated grade to a building as part of an initial seismic assessment of existing buildings.

The IEP enables territorial authorities, building owners and managers to review their building stock as part of an overall risk management process.

Characteristics and limitations of the IEP include:

- It tends to be somewhat conservative, identifying some buildings as earthquake prone, or having a lower *%NBS* score, which subsequent detailed investigation may indicate is less than actual performance. However, there will be exceptions, particularly when critical structural weaknesses (CSWs) are present that have not been recognised from the level of investigation employed.
- It can be undertaken with variable levels of available information, eg exterior only inspection, structural drawings available or not, interior inspection, etc. The more information available the more representative the IEP result is likely to be. The IEP records the information that has formed the basis of the assessment and consideration of this is important when determining the likely reliability of the result.
- It is an initial, first-stage review. Buildings or specific issues which the IEP process flags as being problematic or as potentially critical structural weaknesses, need further detailed investigation and evaluation. A Detailed Seismic Assessment is recommended if the seismic status of a building is critical to any decision making.
- The IEP assumes that the buildings have been designed and built in accordance with the building standard and good practice current at the time. In some instances, a building may include design features ahead of its time - leading to better than predicted performance. Conversely, some unidentified design or construction issues not picked up by the IEP process may result in the building performing not as well as predicted.
- It is a largely qualitative process, and should be undertaken or overseen by an experienced engineer. It involves considerable knowledge of the earthquake behaviour of buildings, and judgement as to key attributes and their effect on building performance. Consequently, it is possible that the *%NBS* derived for a building by independent experienced engineers may differ.
- An IEP may over-penalise some apparently critical features which could have been satisfactorily taken into account in the design.
- An IEP does not take into account the seismic performance of non-structural items such as ceiling, plant, services or glazing.

Experience to date is that the IEP is a useful tool to identify potential issues and expected overall performance of a building in an earthquake. However, the process and the associated *%NBS* and grade should be considered as only indicative of the building's compliance with current code requirements. A detailed investigation and analysis of the building will typically be required to provide a definitive assessment.

An IEP score above 34*%NBS* should be considered sufficient to classify the building as not earthquake prone. However, if further information comes available reassessment may be required.

Basis for the Assessment

- Site subsoil class is “D” according to NZS1170.5

IEP Grades and Relative Risk

Table 1, taken from the NZSEE Guidelines, provides the basis of a proposed grading system for existing buildings, as one way of interpreting the *%NBS* building score. It can be seen that occupants in *Earthquake Prone* buildings (less than 34*%NBS*) are exposed to more than 10 times the risk that they would be in a similar new building. For buildings that are potentially *Earthquake Risk* (less than 67%*NBS*), but not *Earthquake Prone,* the risk is at least 5 times greater than that of an equivalent new building. Broad descriptions of the life-safety risk can be assigned to the building grades as shown in Table 1.

Table 1: Relative Earthquake Risk

Building Grade	Percentage of New Building Strength (*%NBS*)	Approx. Risk Relative to a New Building	Life-safety Risk Description
A+	>100	<1	low risk
A	80 to 100	1 to 2 times	low risk
B	67 to 79	2 to 5 times	low or medium risk
C	34 to 66	5 to 10 times	medium risk
D	20 to 33	10 to 25 times	high risk
E	<20	more than 25 times	very high risk

The building at 45 Victoria Street, Petone, Lower Hutt, has been classified by the IEP as a grade **C** building at its existing condition and is therefore considered to be medium risk.

Conclusions

We have carried out an ISA assessment, using the IEP, for the building at 45 Victoria Street, Petone, Lower Hutt.

The seismic rating concluded for the subject building at its current condition is 55 *% NBS* (IL2) and a seismic rating of 55 %NBS (IL2) corresponds to a Grade C building, as defined by the NZSEE building grading scheme. This would classify the building as medium risk. The low rating was due to the concern for the structural integrity at roof level and inadequate roof bracing. A roof strengthening scheme is suggested. Subsequently we have reassessed the building by assuming that the suggested strengthening at roof level is complete and the roof has adequate bracing capacity. The revised seismic rating becomes 70% NBS (IL2). This will classify the building as a Grade B building upon the completion of the suggested roof strengthening.

The ISA is considered to provide a relatively quick, high-level and qualitative measure of the building’s performance. In order to confirm the seismic performance of this building with more reliability you may wish to request a DSA.

A DSA would likely focus on the out-of-plane seismic performance of the concrete block walls of partial height, the effects of plan irregularities and vertical irregularities (still walls for the lower walls are stiff and upper walls are flexible).

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